

Retrieving Soil Moisture from Spaceborne Passive Microwave Data

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This paper describes the development of soil moisture algorithms for spaceborne passive microwave sensors, including SMMR, TMI, and AMSR. The approach is based on minimum variance estimation using dual-polarization and multi-frequency spaceborne radiometer data, along with ancillary data including topography, soil texture, and vegetation cover. The dual-polarized, multi-frequency brightness temperatures of the spaceborne radiometers are influenced to different degrees by the combined effects of soil moisture, surface roughness, and vegetation type and density. Hence, these multiple data channels can be used to separate soil moisture from the other land parameters in a self-consistent manner. This approach can be readily optimized by incorporating statistical information using Bayesian theory. To evaluate the algorithm performance, in-situ and model-output soil moisture data have been compared with soil moisture retrieved from the spaceborne passive microwave data. Data from the Southern Great Plains (SGP) field experiments have also been used in the algorithm evaluation. The results indicate that spaceborne passive microwave sensors can be used to monitor soil moisture variation and precipitation events at scales comparable to those of present numerical forecast models.